Tactical Technology Office (TTO)

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Briefing prepared for TTO Office Wide BAA Proposers' Day

April 23, 2013

Mission

The Defense Advanced Research Projects Agency (DARPA) was established in 1958 to **prevent strategic surprise** from negatively affecting U.S. national security and **create strategic surprise** for U.S. adversaries by maintaining the technological superiority of the U.S. military.

To fulfill its mission, the Agency relies on **diverse performers** to apply multi-disciplinary approaches to both advance knowledge through basic research and **create innovative technologies** that address current practical problems through applied research.

As the DoD's **primary innovation engine**, DARPA undertakes projects that are finite in duration but that create **lasting revolutionary change**.

DARPA

1 9 5 7

First orbiting satellite. The satellite was not a threat, but the level of technology indicated that the Soviet Union possessed superior capability for intercontinental reconnaissance and bombing.


Sputnik

1 9 5 8

34th President of the United States 1953-1961. Coined the term “military-industrial complex” and warned against its unwarranted influence. Created DARPA in response to Sputnik.


Dwight D. Eisenhower

DARPA organization

AEO	DSO	I2O	MTO	STO	TTO
Adaptive Execution Office	**Defense Sciences Office**	**Information Innovation Office**	**Microsystems Technology Office**	**Strategic Technology Office**	**Tactical Technology Office**
• Coordinated field trials • Technology insertion • DARPA-Combatant Command interaction	• Physical sciences • Neuroscience • Materials • Mathematics • Biology	• Cyber • Data analytics at massive scale • ISR exploitation	• Biology/bio platforms • Computing • Electronic warfare • Manufacturing • Novel concepts • Photonics • PNT • Thermal management	• Finding difficult targets • Communica-tions, networks, and electronic warfare • Shaping the environment	• Ground systems • Maritime systems • Air systems • Space systems

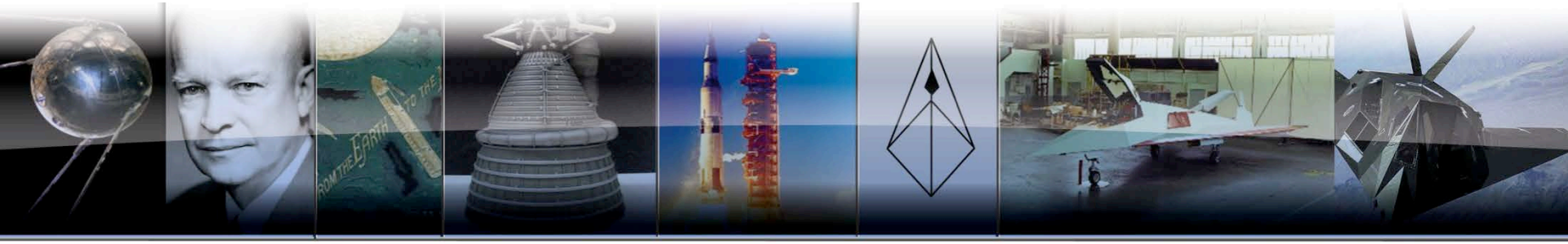
Tactical Technology Office (TTO)

Vision

TTO will rapidly develop new prototype military capabilities that create an asymmetric technological advantage and provide U.S. forces with decisive superiority and the ability to overwhelm our opponents.

Objective

To provide or prevent strategic and tactical surprise with very high-payoff, high-risk development of revolutionary new platforms, weapons, critical technologies and systems, approaches addressing affordability, as well as rapid agile development.



TTO Focus Areas

Ground Systems

Air Systems

Maritime Systems

Space Systems

TTO legacy – a reminder

Ground Systems


1967
M16
(Project Agile)

Tank Breaker

Army Tactical Missile System (Assault Breaker)

Talon

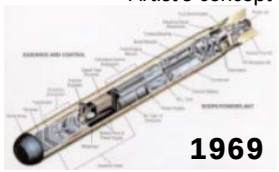
Boomerang

Netfires

BigDog

Maritime Systems

Artist's concept



MK 50 Torpedo Propulsion System

Sea Shadow


1988
Unmanned Undersea Vehicle (UUV)

Submarine Technology (SUBTECH)

Air Systems

Have Blue

Tacit Blue

X-31

Global Hawk

X-45/46/47

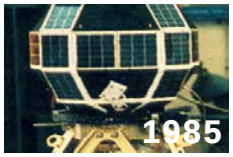
A-160

Damage Tolerant Controls (DTC)

Artist's concept

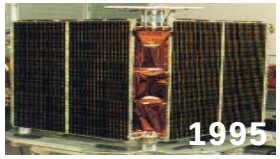
Falcon HTV-2

Space Systems



Global Low Orbiting Message Relay (GLOMR)

Pegasus



DARPASAT

Taurus

Falcon Small Launch Vehicle

Artist's concept

MiTEX

Orbital Express (OE)

Space Surveillance Telescope (SST)

The environment

Multipolar

- Diverse threats
- Low to high intensity spectrum
- Counter-insurgency

Peer / Non-peer threats

- Pacific and other
- Denied environments
- Countermeasures

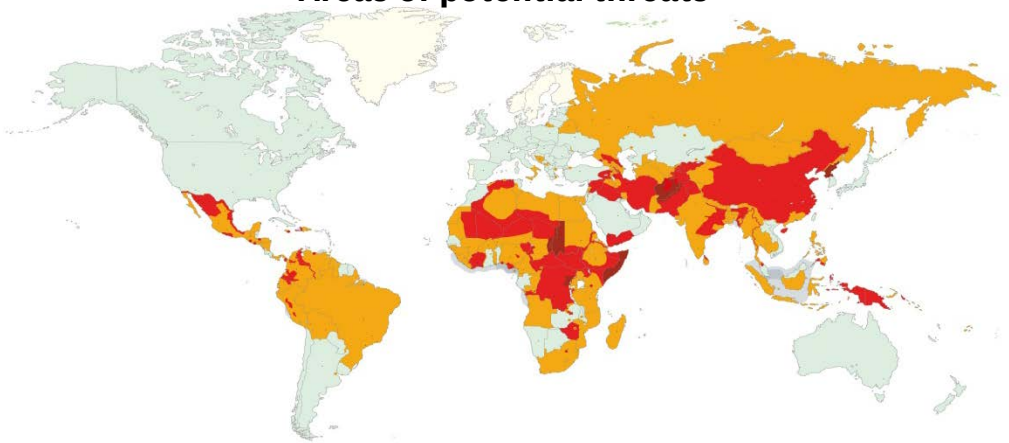
Cost challenge

- Rapid and expansive red force modernization
- Long U.S. development cycles of complex systems
- Smaller U.S. defense industrial base
- Increasing lifecycle cost

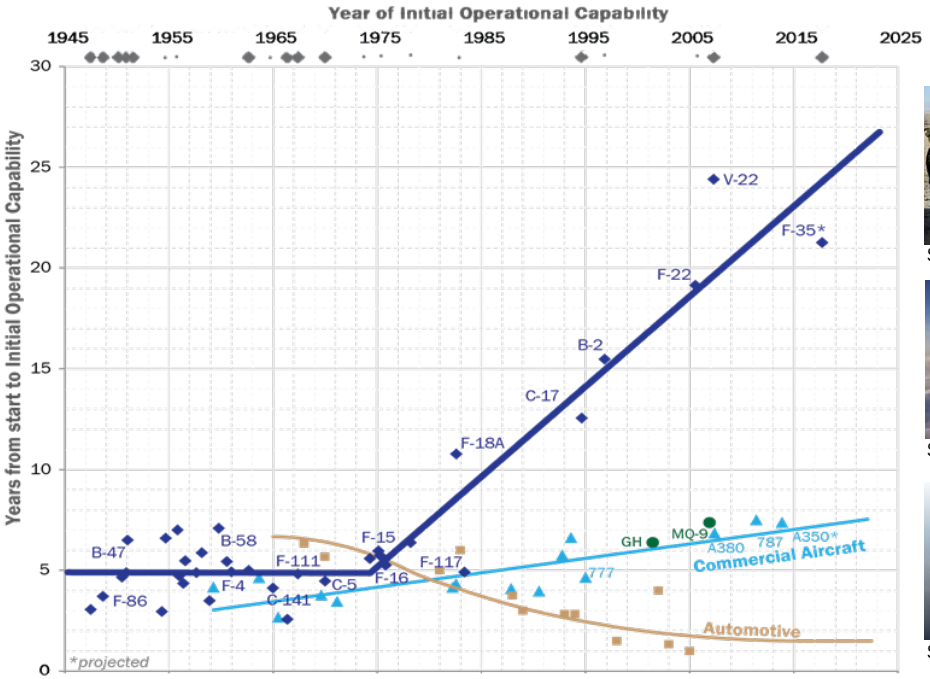
Global market and tech proliferation

- Medium technology swarms
- Rapid countermeasure development
- Cost of labor

Areas of potential threats



Source: DARPA; based on collation of publicly available metrics, including (1) Foreign Policy Failed States Index, (2) Aon Political Risk Map, (3) Control Risks Political Risk Map, and (4) Bradburys Security Risk Map.



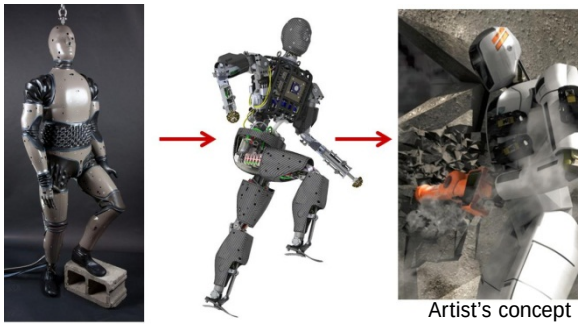
Source: DefenceWeb.co.za

Source: NavyTimes.com

Source: AirForce-Technology.com

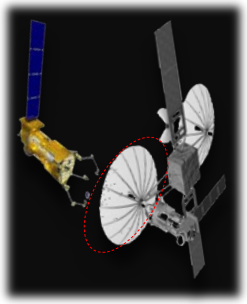
What we look for in programs

- Big wins; decisive superiority
- Drive cost-effectiveness (system and countermeasures)
- Decisive and flexible systems (unbalance)
- Rapid developmental program execution (agile)
- Demonstrating prototypes (new capabilities)
- Unmanned leverage (maximize effectiveness)
- Develop Service buy-in (transition)
- Cross-domain capabilities – cover the “seams” across Service stovepipes



Artist’s concept

Robotics Challenge



Phoenix

ALASA

Artist’s concepts

VTOL X-Plane

Artist’s concepts

Artist’s concept

ACTUV

How we execute our programs

- Accept risk for high payoffs – know the difference between cool Joint Capability Technology Demonstration (JCTD) engineering/incremental payoff vs. breakthrough surprise
- Don’t be upset with failure; be upset with failing to try
- Know your business case and capabilities
- Focus on rapid execution and performer competition through PDR/CDR and beyond if affordable
- Demand the A-team from performers; if you don’t get it, don’t start; all competitive leverage is at the beginning
- Avoid competition with the Services
- Recognize that sometimes you have to break glass
- Develop good relationships with partners
- Partners with resources can really help us make a difference

Strategy map to focus areas

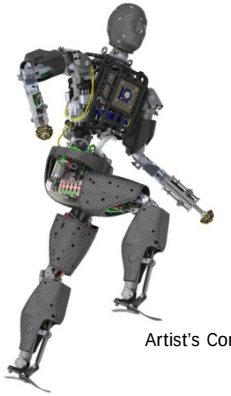
Work in four domains: Ground, Maritime, Air and Space

Do not focus on: Cyber Tools, Counter WMD, PNT, Comms

- Enable precision strike at extended ranges
- Enable air dominance
- Protect our critical assets (Ground, Maritime, Air and Space)
- Develop flexible, agile and precise ground combat systems
- Demonstrate critical asymmetric capabilities
- Attack the cost equation challenges and prototype new (agile) systems engineering approaches
- Leverage key DARPA technology subsystem advances

Systems focus areas

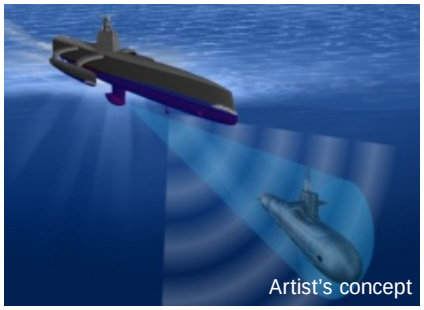
Ground Systems



DARPA Robotics Challenge (DRC)

Legged Squad Support System (LS3)

Maritime Systems

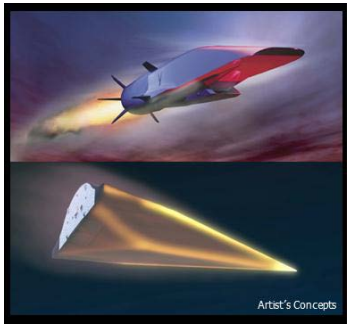


Anti-Submarine Warfare (ASW) Continuous Trail Unmanned Vessel (ACTUV)

Long Range Anti-Ship Missile (LRASM)

Air Systems

Vertical Take-Off and Landing (VTOL) X-Plane



Hypersonic Technologies

Space Systems

Phoenix

Airborne Launch Assist Space Access (ALASA)

Crosscutting Themes

Agile development approach, autonomy, unmanned systems, power and propulsion

Amplify unit/Soldier effectiveness

Technical goals

- Lethality overmatch and scalable effects
- Agility and mobility
- Reduce footprint
- Manned and unmanned operations
- Digital systems

Current efforts

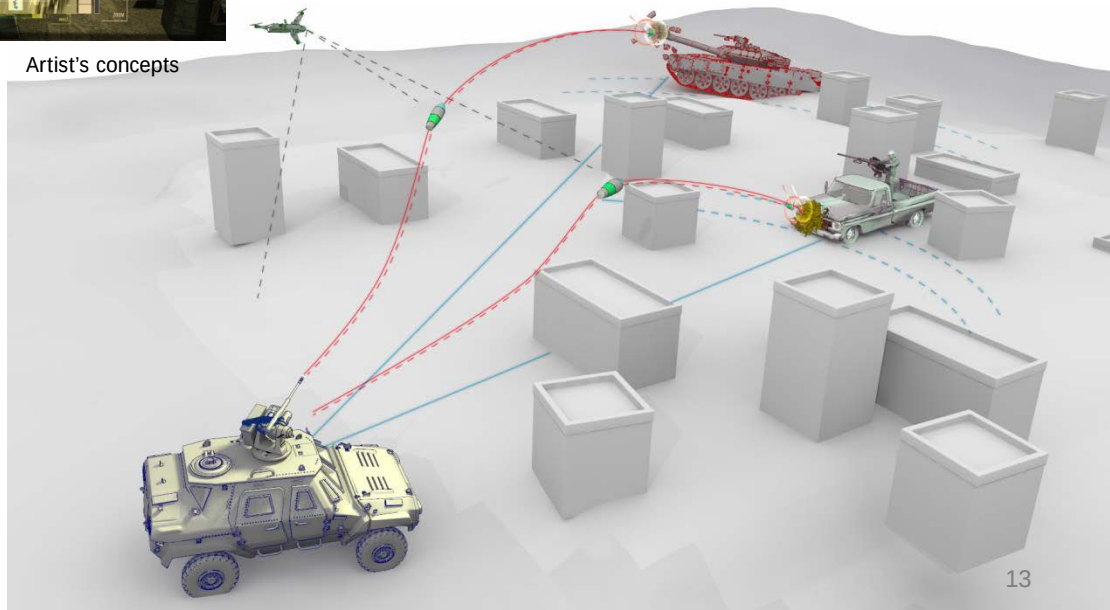
Program	Objective
DARPA Robotics Challenge (DRC)	Develop human-compatible robot systems for response to natural and man-made disasters.
Extreme Accuracy Tasked Ordnance (EXACTO)	Demonstrate closed-loop guided flight of a .50-caliber bullet/weapon system and survivability of bullet components.
Fast, Adaptable, Next Generation (FANG) Ground Combat Vehicle	Reduce the time to develop a ground vehicle by at least fivefold.
Instant Foundry Adaptive Through Bits (iFAB)	Develop a foundry-style manufacturing capability.
Legged Squad Support (LS3)	Develop a quadruped unmanned ground vehicle to lighten the Soldier's load, guided by Soldier-bounded autonomy.
META	Develop novel tools to enable the ability to develop complex systems based on rapid (correct) design and development.
Persistent Close Air Support (PCAS)	Enhance dismounted ground personnel effectiveness with CAS equipment enabling precise coordination and targeting of airborne weapons.

Potential future investment in ground systems

Squad X

Medium Caliber Precision Weapon

Artist's concepts



Maritime systems

Control the sea, influence events on land

Technical goals

- Situational awareness/threats
- New capabilities
- Strike (asymmetric, affordable, precise, extended range)
- High-value asset protection

Current efforts

Program	Objective
Anti-Submarine Warfare (ASW) Continuous Trail Unmanned Vessel (ACTUV)	Demonstrate an unmanned vessel optimized to provide continuous overt trail of threat submarines.
Long Range Anti-ship Missile (LRASM)	Demonstrate an integrated prototype design of a high-effectiveness anti-ship strike capability.
Tactically Expandable Maritime Platform (TEMP)	Develop modular technologies to convert an unmodified commercial containership into a surrogate naval platform capability.
Tactically Exploitative Reconnaissance Node (TERN)	Enable robust global access by demonstrating a medium-altitude, long-endurance unmanned vehicle operable from smaller ships.

Air systems

Control the air and strike anytime/anywhere

Technical goals

- High-speed precision strike
- Extend performance envelope (speed, range, payload, endurance, survivability)
- Address the tyranny of distance
- Advanced propulsion and power systems

Current efforts

Program	Objective
Hypersonic Technologies	Develop and test unmanned, rocket-launched, maneuverable, hypersonic air vehicles for critical missions.
Mission Adaptive Rotor (MAR)	Develop foundational technologies to enable high speed and efficient hover through advanced rotor designs.
Transformer (TX)	Develop a modular compact autonomous cargo delivery vertical lift system.
Triple Target Terminator (T3)	Develop a high-speed, long-range aerodynamic missile that would defeat current and projected enemy targets.
Vertical Take-off and Landing (VTOL) X-Plane	Develop and demonstrate a VTOL air vehicle capable of efficient hover and improved high-speed flight.

Potential future investment in air systems

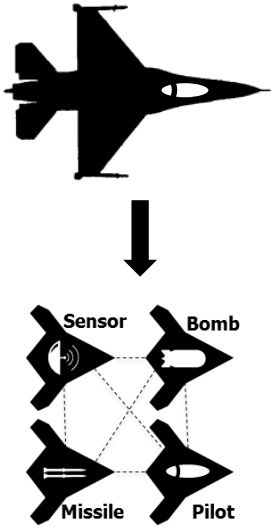
Novel UAVs

Artist's concepts

Surrogate piloting capabilities

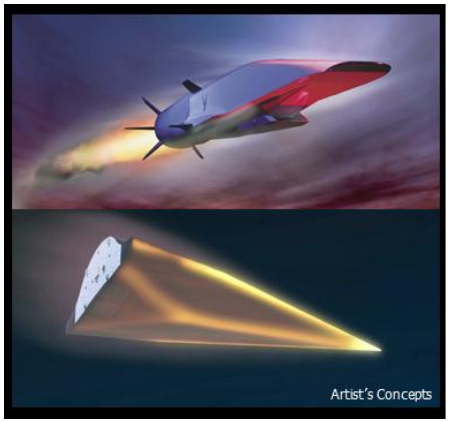
Artist's concept

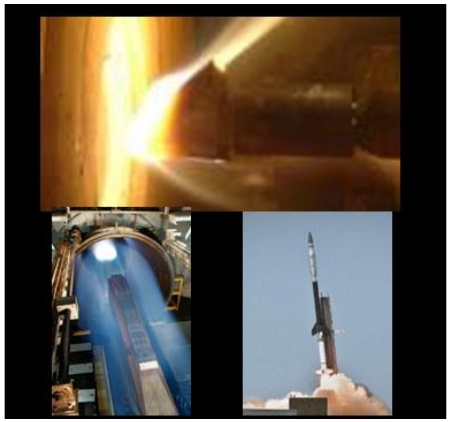
Cooperative manned and unmanned air operations

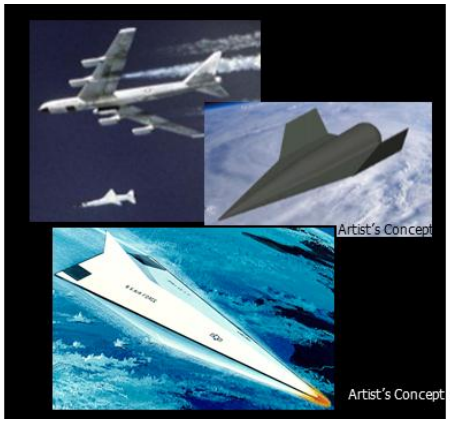


Artist's concept

Integrated Hypersonics (IH)







Space systems

Normalize and simplify space

Technical goals

- Affordable routine access
- Reduce escalating systems cost
- New capability
- Survivability/resilience/reconstitution/autonomy
- Disaggregation/simplification
- Space situational awareness

Current efforts

Program	Objective
Airborne Launch Assist Space Access (ALASA)	Enable small satellites to be deployed to orbit from an airborne platform, allowing performance improvement, reducing range costs, and flying more frequently, which drives cost per pound down.
Galileo	Enable mission protection, anomaly resolution and satellite repurposing.
International Space Station SPHERES Integrated Research Experiments (InSPIRE)	Upgrade spheres with manipulator arms to support Phoenix and upgrade the docking ports to reduce fuel consumption.
Membrane Optical Imager for Real-Time Exploitation (MOIRE)	Provide persistent tactical video coverage to the warfighter.
OrbitOutlook	Demonstrate a cost-effective way to increase the amount and quality of SSA information critical to warfighters: purchase data rather than build and operate sensors.
Phoenix	Develop technologies to harvest and re-use components from retired, non-working satellites in GEO and demonstrate the ability to create new space systems at a greatly reduced cost.
Space Surveillance Telescope (SST)/SST-Australia (SST-AUS)	Develop an advanced ground-based optical system for rapid, wide-area, uncued detection and tracking of faint objects in deep space. Refine and evaluate data processing techniques, such as those developed under the Ibex effort.

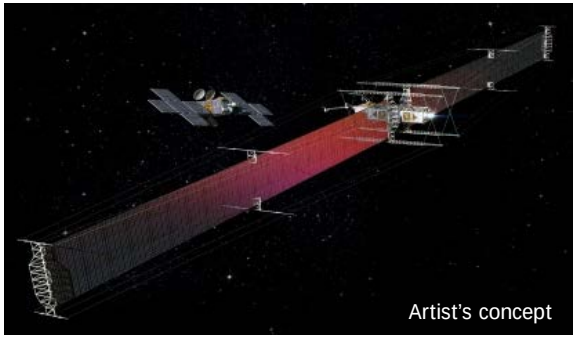
Potential future investment in space systems

Small affordable launch

Small Responsive Space Access X-Plane

Artist's concept

Experimental Solar Electric Propulsion Vehicle (X-SEP)



Evolving threats/capabilities to consider

- Counter-UAV (threats are developing fast as we are) – ours and theirs
- Swarm and counterswarm capabilities (vulnerable maritime citadels)
- Development of capable unmanned systems operating in contested/denied environments (will our systems survive or acceptably attrit—low cost)
- Missile defense/counterhypersonics – who defends and how?
- Advanced sea-to-land rapid transport remains a big challenge

We will initiate studies in these areas as a discussion/starting point

Tactical Technology Office (TTO): Office Wide Broad Agency Announcement (BAA)

Pamela Melroy, Deputy Director

Briefing prepared for TTO Office Wide BAA Proposers' Day

April 23, 2013

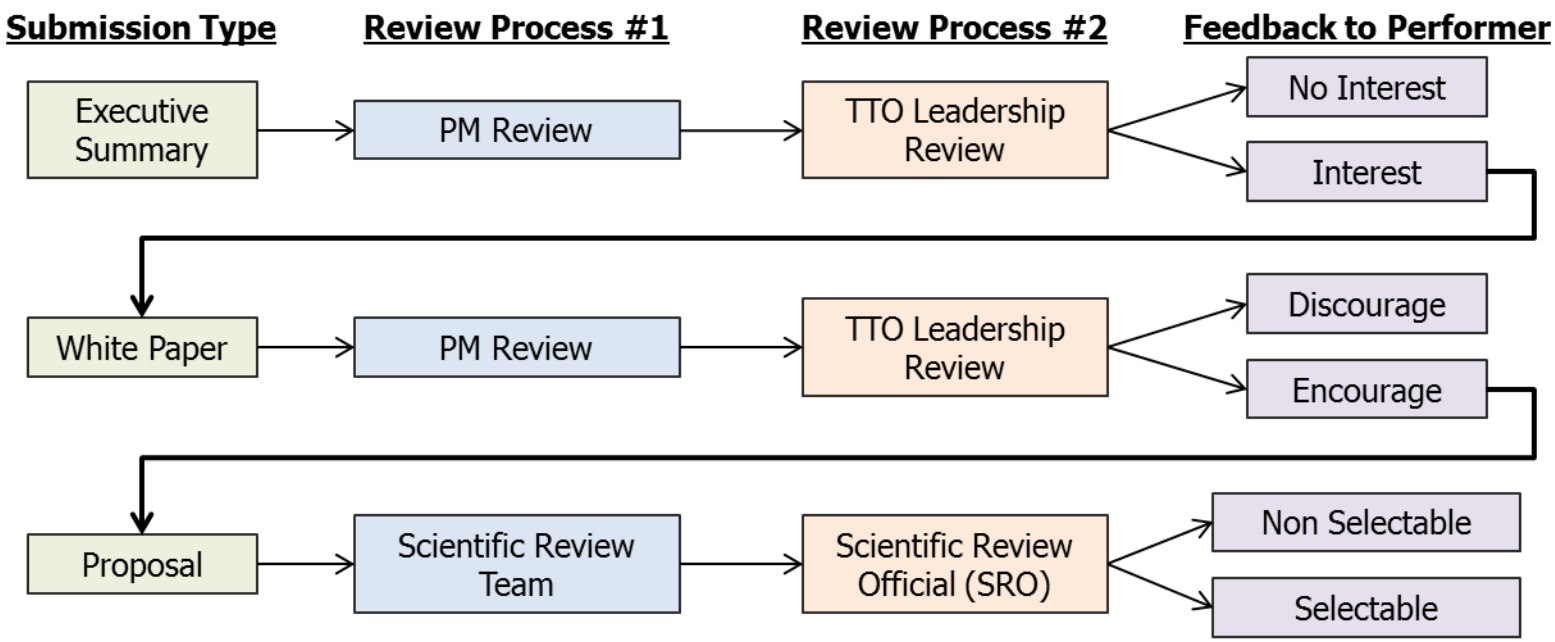
Why are we here today?

- We want to make sure that you understand our approach including:
  - The areas we are focusing on and why, so that you can be more effective in what you propose
  - Our process and the realities about the way our office wide BAA works
- We want to answer your questions:
  - During tomorrow's sidebars, tell us your ideas for truly revolutionary technologies that are aligned with a PM's vision
  - Tell us your thoughts on how we can tap into new ideas that can strengthen our existing programs
- The interchange of ideas between DARPA and industry has always been at the heart of TTO's approach to developing revolutionary technologies:
  - Many programs have started as seedlings from office wide BAA submissions

How does it work?

- 1-year-long office wide BAA:
  - Designated BAA coordinator and email address
  - Does not supersede program BAAs
- Executive summaries, white papers and proposals

Our "engine" is made up of our PMs' visions



Things to keep in mind (1 of 2)

- No-Interest/Discourage means:
  - In the form you submitted, we are not interested in your idea because:
    - The submission does not present an approach to developing technology that is aligned with the DARPA/TTO focus areas and interests
    - The submission is not important to TTO's areas of responsibility as outlined in the BAA
    - The submission is not suitably structured to produce a TTO systems-level demonstration or product
    - The submission does not substantiate a revolutionary military capability within the TTO portfolio
    - The proposed approach does not clearly identify current limitations that would be overcome
    - The submission does not identify barriers to implementing new operational concepts and postulate solutions
    - The submission does not convey technology significantly beyond the state of the art
  - It does NOT mean that you cannot resubmit after changing your concept or that you cannot submit a full proposal… BUT chances of success are extremely slim

Things to keep in mind (2 of 2)

- Interest/Encourage means:
  - We find your idea interesting and we would like to know more
  - It does NOT mean that you are funded or that a full proposal will be accepted

- Funding potential:
  - Intent is to fund seedlings at < $1M
  - Proposals may have options for a larger follow-on program
  - Efforts larger than seedlings are likely to be handled as a program (options or through a program BAA)

Do and don't

- DO read the BAA-13-22 document in its entirety
- DO use the executive summary and white paper process
- DO forward any questions related to the DARPA/TTO Office Wide BAA to DARPA-BAA-13-22@darpa.mil

- Do NOT hand carry paper copies to the DARPA building
- Do NOT email/fax in your executive summary, white paper or proposal to the BAA-13-22 mailbox
- Do NOT call to check on the status of your submission

Questions?

- How can we improve the process?*

*…please don’t ask us to change the Federal Acquisition Regulations!

www.darpa.mil